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EXAMINER	
THOMPSON, JAMES A	
ART UNIT	**PAPER NUMBER**
2625	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/760,924	JIANG ET AL.
	Examiner	**Art Unit**
	James A. Thompson	2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _17 May 2006 and 05 June 2006_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1,2,4-18,20-27,29-43 and 45-50_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _23 April 2001_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _6/5/2006_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see page 16, line 29 to page 17, line 9, filed 17 May 2006, with respect to the objection to the drawings have been fully considered and are persuasive. The objection to the drawings listed in item 2 of the previous office action, dated 07 February 2006 and mailed 21 February 2006, has been withdrawn.

2. Applicant's arguments, see page 17, lines 11-25, filed 17 May 2006, with respect to the rejections of claims 4 and 29 under 35 USC §112, 2nd paragraph have been fully considered and are persuasive. The rejections of claims 4 and 29 under 35 USC §112, 2nd paragraph listed in items 3-5 of said previous office action have been withdrawn.

3. Applicant's arguments filed 17 May 2006 have been fully considered but they are not persuasive.

Regarding beginning of "Remarks" on page 15 to page 16, line 28: The present amendments to the claims and specification have been fully considered by Examiner.

Regarding page 17, line 28 to page 19, line 3: Campbell (US Patent 4,989,090) teaches the general principle of calculating motion values based on the change in value between pixels at the same position but different fields, and in the same field but at different positions. This is a very basic teaching which forms the overall structure of the rejection with respect to the claimed motion metric values. Kawada (US Patent 5,699,499) is relied upon to teach particular aspects of the spatial median

filter [see last paragraph of page 6 of said previous office action]. While the teachings of Kawada relate to motion, Kawada is not relied upon to teach the specific aspects of the claimed motion metric values. Zhang (US Patent 6,037,986) is relied upon to teach what Campbell lacks, namely that the motion values are specifically motion metric values [column 6, lines 41-44 and lines 56-59 of Campbell, as recited on page 7, lines 18-20 of said previous office action]. While the specific disclosure in Zhang cited by Applicant may differ somewhat from the disclosure presented in Applicant's present specification, the motion metric values set forth in Zhang are clearly motion metric values as understood in the art. Applicant is respectfully reminded that, although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Furthermore, one of ordinary skill in the art at the time of the invention would have readily seen that Campbell could be modified according to the teachings of Zhang. While Campbell uses the more primitive approach of applying a simple differencing scheme for motion detection, Campbell is also a much older reference. Given the more modern method of motion detection taught by Zhang, one of ordinary skill in the art at the time of the invention would have appreciated that the better method of motion detection described in Zhang could applied to the system of Campbell. In fact, as stated on page 8, lines 1-3 of said previous office action, one of ordinary skill in the art at the time of the invention would have been motivated to apply the teachings of Zhang since the method of motion detection taught

by Zhang is more robust with respect to noisy pels, thus providing a clear benefit.

In response to Applicant's allegation that a different aspect of video processing is presented or a different starting point is used to arrive at some type of motion detection parameter than that which is claimed, Examiner notes that both Campbell and Zhang compute motion values with respect to the pixel (a.k.a. "pel" in Zhang) values themselves, and Zhang teaches the specifically claims motion metric values. Further, Applicant is respectfully reminded that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, as stated above, one of ordinary skill in the art at the time of the invention would simply have used the specific type of motion detection taught by Zhang, namely motion metric values.

Regarding page 19, line 4 to page 20, line 5: As stated above, Kawada is not relied upon for teaching the motion metric values. Campbell teaches the overall system, which uses the basic concept of motion values. By applying the motion metric values taught by Zhang instead of the motion values of Campbell, an improved and more robust system is achieved. Both Campbell and Zhang operate on pixel values to arrive at the motion value, the motion value being specifically a motion metric value is Zhang. Thus, given both the teachings present in Zhang and the motivation set forth in Zhang, one of ordinary skill in the art

at the time of the invention would clearly have been able to apply the calculations taught by Zhang which determine motion metric values, rather than use the more primitive motion values taught by Campbell. Zhang merely requires different calculations which can be performed on the same input pixels present in the video input stream taught by Campbell.

Finally, as stated above, while there may or may not be differences between what is set forth in Applicant's present specification, the motion metric values recited in the claims is clearly rendered obvious by the teachings of Campbell and Zhang.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. **Claims 1-2, 4-18, 20-27, 29-43 and 45-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Campbell (US Patent 4,989,090) in view of Kawada (US Patent 5,699,499) and Zhang (US Patent 6,037,986).**

Regarding claims 1 and 26: Campbell discloses an apparatus (figure 2 of Campbell). Additional details of said apparatus are further shown in figure 3, figure 6A and figure 7 of Campbell (column 4, lines 56-58 and lines 67-68; and column 5, lines 4-6 of Campbell).

Campbell further discloses a frame (interfield) interpolator (figure 2(22) of Campbell) for yielding a frame based luminance value for a missing pixel by using frame based interpolation (column 6, lines 35-37 and lines 43-45 of Campbell); and a field (intrafield) interpolator (figure 2(28) and column 7, lines 10-14 of Campbell) for yielding a field based luminance value for a missing pixel (figure 1(i) and column 5, lines 29-32 of Campbell) by using field based interpolation (column 7, lines 10-14 of Campbell). The spatial interpolator (figure 2(28) of Campbell) computes a spatial average of pixels (column 7, lines 10-14 of Campbell) used to interpolate the value of the missing pixel (figure 1(i) and column 5, lines 29-32 of Campbell) between two known pixels (figure 1(a,b) and column 5, lines 33-36 of Campbell) on the same field (figure 1(F1) and column 5, lines 29-34 of Campbell). Furthermore, the interpolated value is a luminance value of the missing pixel since the pixel data is given as a luminance data stream (column 7, lines 40-42 of Campbell).

Campbell further discloses a luminance difference unit (figure 3(32) of Campbell) for obtaining luminance value differences of pixels (column 7, lines 40-45 of Campbell) in prescribed fields of an image (figure 1(F0,F2) and column 7, lines 40-43 of Campbell) in accordance with prescribed criteria (column 7, lines 44-45 of Campbell); and a motion detector (figure 2(30) and column 7, lines 38-39 of Campbell) supplied with prescribed ones of said luminance value differences (column 7, lines 40-42 of Campbell) for generating a motion value at a missing pixel (column 7, lines 53-55 of Campbell) and for filtering said pixel differences to remove aliases under predetermined motion conditions (column 7, lines 46-50 of Campbell). As is well-known in

the art, aliasing occurs when the signal sampling rate is below at least twice the frequency of the highest frequency component. This is known as the Nyquist Criterion. By applying a low-pass filter to eliminate any residual high frequency components that may include noise, chroma sideband pollution, etc. (column 7, lines 46-50 of Campbell), any potential aliasing is removed.

Campbell further discloses a controllable combiner (figure 2(26) of Campbell) supplied with said frame based luminance value (column 6, lines 54-60 of Campbell) and said field based luminance value (column 6, lines 46-48 of Campbell) and being responsive to a representation of said motion value (column 6, lines 65-68 of Campbell) to controllably supply as an output a luminance value for said missing pixel (column 6, lines 58-62 of Campbell), wherein said controllable combiner, in response to said representation of said motion value indicating the image is still, outputs said frame based (interfield) luminance value, and, in response to said representation of said motion value indicating motion in the image, outputs said field based (intra-field) luminance value (column 6, lines 58-62 of Campbell). As can be clearly seen in figure 2 of Campbell, when the switch (figure 2(26) of Campbell), spatial interpolator (figure 2(28) of Campbell), and motion detector (figure 2(30) of Campbell) are added to the device (column 6, lines 54-58 of Campbell), the switch determines whether the output of said spatial interpolator or the temporal median filter (figure 2(22) of Campbell).

Campbell does not disclose expressly that said motion value generated by said motion detector is specifically a motion metric value; a spatial median filter supplied with at least three of said motion metric values for determining a median motion metric value and for removing random noise from said

luminance differences without creating spurious motion values; and that said controllable combiner is responsive to a representation of said median motion metric value.

Kawada discloses a spatial median filter (figure 1 of Kawada) supplied with at least three of said motion values (column 3, lines 6-9 of Kawada) for determining a median motion value (column 3, lines 1-5 of Kawada) and for removing random noise from said luminance differences without creating spurious motion values (column 2, lines 59-67 of Kawada).

Campbell and Kawada are combinable because they are from the same field of endeavor, namely filtering, interpolating and processing video image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the spatial median filter for motion values taught by Kawada to the motion value calculation and processing taught by Campbell. Said controllable combiner would thus be responsive to a median motion value instead of a single motion value. The motivation for doing so would have been to provide for satisfactory visual interpolation in blocks containing boundaries of objects (column 1, line 67 to column 2, line 3 of Kawada). Therefore, it would have been obvious to combine Kawada with Campbell.

Campbell in view of Kawada does not disclose expressly that said motion value generated by said motion detector is specifically a motion metric value; and that said median motion value is specifically a median motion metric value.

Zhang discloses generating a motion metric value to detect the level of motion (column 6, lines 41-44 and lines 56-59 of Zhang); and controllably supplying output values based on said

median motion metric value (column 10, line 63 to column 11, line 4 of Zhang).

Campbell in view of Kawada is combinable with Zhang because they are from the same field of endeavor, namely filtering, interpolating and processing video image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to detect motion by specifically using motion metric values as the motion values; and control the output based on said motion metric values. Thus, the median motion value would be a median motion metric value. The motivation for doing so would have been that the use of motion metric values for detecting motion is more robust with respect to noisy pels (column 3, lines 35-38 and lines 43-47 of Zhang). Therefore, it would have been obvious to combine Zhang with Campbell in view of Kawada to obtain the invention as specified in claims 1 and 26.

Regarding claims 17 and 42: The arguments regarding claims 1 and 26 are incorporated herein.

Campbell further discloses a look-up table (figure 4 of Campbell) including blending factor values related to said motion values (motion metric values as taught by Zhang) (column 7, lines 12-16 of Campbell) and being responsive to supplied motion metric values for supplying as an output corresponding blending factor values (column 7, lines 8-12 of Campbell). The switch (figure 2(26) of Campbell) is used to multiply the intra-field signal (figure 2(29) of Campbell) by a control value of k, said control value being between zero and unity, and the inter-field signal (figure 2(23) of Campbell) by (1-k) (column 7, lines 17-22 of Campbell). Said control value is a function of the motion activity (column 7, lines 26-29 of Campbell). Said

control value is stored for a specific number of steps, relating the motion amplitude and the fractional value of k (figure 4 and column 7, lines 22-25 of Campbell). Since the k values are stored in memory as a particular number of steps relating quantities, in other words taking the motion amplitude as an input and outputting the corresponding value of k, then said memory storing the specific values of k, which is accessed by the apparatus, constitutes a look-up table.

Regarding claims 2, 18, 27 and 43: Campbell does not disclose expressly that said spatial median filter is a nine-value spatial median filter.

Kawada discloses a nine-value (figure 3 and column 3, lines 18-22 of Kawada) spatial median filter (column 3, lines 22-26 of Kawada).

Campbell and Kawada are combinable because they are from the same field of endeavor, namely filtering, interpolating and processing video image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use a nine-value filter, as taught by Kawada, for the spatial median filter of Campbell. The motivation for doing so would have been to provide for satisfactory visual interpolation in blocks containing boundaries of objects (column 1, line 67 to column 2, line 3 of Kawada). Therefore, it would have been obvious to combine Kawada with Campbell to obtain the invention as specified in claims 2, 18, 27 and 43.

Regarding claims 4 and 29: Campbell discloses that said frame based luminance value is generated by said frame (inter-field) interpolator in accordance with $C_0=C_{-1}$, where C_0 is the luminance value of the missing pixel in field f_0 and C_{-1} is the luminance value of a pixel corresponding to the missing pixel in

a last prior field f_{-1} relative to field f_0 (column 5, lines 40-44 of Campbell), and said field based luminance value is generated by said field (intrafield) interpolator in accordance with $C_0 = \frac{(N_0 + S_0)}{2}$, where N_0 is the luminance value of a pixel above and in the same field f_0 as the missing pixel, and S_0 is the luminance value of a pixel below and in the same field f_0 as the missing pixel (column 5, lines 44-45 and lines 50-51 of Campbell). If there is no motion, then the luminance value of a pixel (d) corresponding to the missing pixel in a last prior field (F2) can be used to represent the missing pixel (i) (column 5, lines 40-44 of Campbell). If there is motion (column 5, lines 44-45 of Campbell), the average of the pixel above (a) and the pixel below (b) the missing pixel (i) is used (column 5, lines 50-51 of Campbell), an average being, by definition, $i = \frac{(a + b)}{2}$. The use of different symbols (C_0, C_{-1}, f_0, f_{-1}, N_0, S_0) to represent the same corresponding physical quantities (i, d, F1, F2, a, b) is simply a matter of notation.

Regarding claims 10 and 35: Campbell discloses a look-up table (figure 4 of Campbell) including blending factor values related to said motion values (motion metric values as taught by Zhang) (column 7, lines 12-16 of Campbell) and being responsive to said median motion metric value from said spatial median filter for supplying as an output a corresponding blending factor value as said representation of said median motion metric value (column 7, lines 8-12 of Campbell). The switch (figure 2 (26) of Campbell) is used to multiply the intrafield signal (figure 2(29) of Campbell) by a control value of k, said control value being between zero and unity, and the interfield signal

(figure 2(23) of Campbell) by (1-k) (column 7, lines 17-22 of Campbell). Said control value is a function of the motion activity (column 7, lines 26-29 of Campbell). Said control value is stored for a specific number of steps, relating the motion amplitude and the fractional value of k (figure 4 and column 7, lines 22-25 of Campbell). Since the k values are stored in memory as a particular number of steps relating quantities, in other words taking the motion amplitude as an input and outputting the corresponding value of k, then said memory storing the specific values of k, which is accessed by the apparatus, constitutes a look-up table.

Regarding claims 11, 20, 36 and 45: Campbell discloses that said controllable combiner is responsive to said blending factor for supplying as an output a luminance value for said missing pixel in accordance with $C_0 = \alpha \frac{(N_0 + S_0)}{2} + (1-\alpha)C_1$, where C_0 is the luminance value of the missing pixel in field f_0, C_{-1} is the luminance value of a pixel corresponding to the missing pixel in a last prior field f_{-1} relative to the field f_0, N_0 is the luminance value of a pixel above and in the same field f_0 as the missing pixel, S_0 is the luminance value of a pixel below and in the same field f_0 as the missing pixel and α is the blending factor (column 7, lines 17-22 of Campbell). As discussed above in the arguments regarding claims 4 and 29, said field based luminance value is generated by said field (intrafield) interpolator in accordance with $C_0 = \frac{(N_0 + S_0)}{2}$ (column 5, lines 44-45 and lines 50-51 of Campbell) and said frame based luminance value is generated by said frame (interfield) interpolator in accordance with $C_0 = C_{-1}$ (column 5, lines 40-44 of Campbell). A control

signal (k) is used such that said field based luminance value is multiplied by k and said frame based luminance value is multiplied by (1-k) and the two signals are blended together (column 7, lines 17-22 of Campbell). k can be represented by α since the variables represent the same quantity and the choice between k and α is therefore a simple matter of notation. The equation for the output luminance value for the missing pixel can therefore be represented as $C_0 = \alpha \frac{(N_0 + S_0)}{2} + (1-\alpha)C_1$.

Regarding claims 5, 12, 21, 30, 37 and 46: Campbell does not disclose expressly that said luminance difference unit generates a plurality of prescribed luminance value differences of pixels in prescribed fields of the image, and said motion detector employs prescribed relationships of said luminance value differences to generate said motion metric value.

Kawada discloses that generating a plurality of prescribed luminance value differences of pixels in prescribed fields of the image (column 3, lines 5-8 of Kawada), and employing prescribed relationships of said luminance value differences to generate said motion value (motion metric values as taught by Zhang) (column 4, lines 30-32 and lines 38-45 of Kawada). A plurality of prescribed motion metric values for pixels are computed, specifically for a neighborhood of pixels (column 3, lines 5-8 of Kawada), which requires the luminance difference of said pixels.

Campbell and Kawada are combinable because they are from the same field of endeavor, namely filtering, interpolating and processing video image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply multiple prescribed calculations of motion values for a prescribed set of pixels, as taught by Kawada, said motion

values calculated using luminance differences, as specifically taught by Campbell. The motivation for doing so would have been to provide for satisfactory visual interpolation in blocks containing boundaries of objects (column 1, line 67 to column 2, line 3 of Kawada). Therefore, it would have been obvious to combine Kawada with Campbell to obtain the invention as specified in claims 5, 12, 21, 30, 37 and 46.

Regarding claims 6, 13, 22, 31, 38 and 47: Campbell discloses that said luminance difference unit generates the absolute value (column 7, lines 51-53 of Campbell) of the difference between corresponding pixel luminances in frames F0 and F2 (column 7, lines 40-44 of Campbell) in order to detect motion (column 7, lines 29-32 of Campbell). Since the pixel to be interpolated (i) is in frame F1 (figure 1 of Campbell), F0 and F2 therefore correspond to frames f_1 and f_{-1}, and c and d correspond to pixels C_1 and C_{-1}. If the luminance difference for the center pixel is denoted as Δ_c, then said luminance difference of the frame is therefore given as $\Delta_c = |C_1 - C_{-1}|$.

Campbell further discloses that the missing pixel (i) is interpolated as the average of the pixel above (a) and pixel below (b) said missing pixel (column 5, lines 50-51 of Campbell), which would therefore be given by the equation $i = \frac{a+b}{2}$. This relationship could also be expressed as $C_0 = \frac{(N_0 + S_0)}{2}$, where N_0 is the luminance value of a pixel above and in the same field f_0 as the missing pixel, and S_0 is the luminance value of a pixel below and in the same field f_0 as the missing pixel, since the change in variable name is a simple matter of notation. Campbell further discloses that the video image data is interlaced (figure 1 and column 5, lines 36-39 of Campbell), so a

corresponding pixel position in every second frame will have to be interpolated in a similar manner. Therefore, the spatially interpolated value for the corresponding pixel position in the field f_{-2}, which is the second prior field relative to f_0, is given by $C_{-2} = \frac{(N_{-2} + S_{-2})}{2}$, where C_{-2} is the corresponding missing pixel in field f_{-2}, N_{-2} is the luminance value of a pixel above and in the same field f_{-2} as the missing pixel (C_{-2}), and S_{-2} is the luminance value of a pixel below and in the same field f_{-2} as the missing pixel (C_{-2}).

Campbell does not disclose expressly that said luminance difference unit generates a second luminance difference value in accordance with $\Delta_a = \left|\frac{N_0 + S_0}{2} - \frac{N_{-2} + S_{-2}}{2}\right|$.

Kawada discloses obtaining a motion vector of a center pixel (b1) in a block (figure 3(b1) and column 3, lines 18-22 of Kawada).

Campbell and Kawada are combinable because they are from the same field of endeavor, namely filtering, interpolating and processing video image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to also obtain a motion vector (luminance difference) directly from the center pixel, as taught by Kawada. Since, as taught by Campbell, the video image data is interlaced and the center pixel of both f_0 and f_{-2} must be interpolated, the resultant motion vector (Δ_a) would be $\Delta_a = \left|\frac{N_0 + S_0}{2} - \frac{N_{-2} + S_{-2}}{2}\right|$. The motivation for doing so would have been to provide for satisfactory visual interpolation in blocks containing boundaries of objects (column 1, line 67 to column 2, line 3 of Kawada). Therefore, it would

have been obvious to combine Kawada with Campbell to obtain the invention as specified in claims 6, 13, 22, 31, 38 and 47.

Regarding claims 7, 14, 23, 32, 39 and 48: Campbell discloses selecting the largest component of motion values at the vicinity of the pixel to be interpolated (i) (column 7, lines 35-37 of Campbell). For the motion vectors calculated above in the arguments regarding claims 6, 13, 22, 31, 38 and 47, this would cause said motion detector to give a resultant motion metric value (Δ) in accordance with $\Delta = \max(\Delta_c, \Delta_a)$.

Regarding claims 8, 15, 24, 33, 40 and 49: Campbell discloses that said luminance difference unit generates the absolute value (column 7, lines 51-53 of Campbell) of the difference between corresponding pixel luminances in frames F0 and F2 (column 7, lines 40-44 of Campbell) in order to detect motion (column 7, lines 29-32 of Campbell). Since the pixel to be interpolated (i) is in frame F1 (figure 1 of Campbell), F0 and F2 therefore correspond to frames f_1 and f_{-1}, and c and d correspond to pixels C_1 and C_{-1}. If the luminance difference for the center pixel is denoted as Δ_c, then said luminance difference of the frame is therefore given as $\Delta_c = |C_1 - C_{-1}|$.

Campbell further discloses that the video image data is interlaced (figure 1 and column 5, lines 36-39 of Campbell), so a motion vector will have to take into account the corresponding pixel values in every other frame.

Campbell does not disclose expressly that said luminance difference unit generates a second luminance difference value in accordance with $\Delta_n = |N_0 - N_{-2}|$, where N_0 is a luminance value of a pixel above and in the same field f_0 as the missing pixel and N_{-2} is a luminance value of a pixel above the missing pixel and in

the second prior field f_{-2} relative to the field f_0 including the missing pixel, and generates at least a third luminance difference value in accordance with $\Delta_s = |S_0 - S_{-2}|$, where S_0 is a luminance value of a pixel below and in the same field f_0 as the missing pixel and S_{-2} is a luminance value of a pixel below the missing pixel and in the second prior field f_{-2} relative to the field f_0 including the missing pixel.

Kawada discloses calculating motion vectors in a center pixel (figure 3(b1) of Kawada) and the pixels adjacent to said center pixel (figure 3 and column 3, lines 1-5 of Kawada), which therefore includes the pixel above and below said center pixel.

Campbell and Kawada are combinable because they are from the same field of endeavor, namely filtering, interpolating and processing video image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to further obtain motion vectors (luminance differences) for the pixels above and below said center pixel, as taught by Kawada. Since, as taught by Campbell, the video image data is interlaced, the resultant motion vectors (Δ_n, Δ_s) would be $\Delta_n = |N_0 - N_{-2}|$ and $\Delta_s = |S_0 - S_{-2}|$. The motivation for doing so would have been to improve the visual interpolation field quality (column 2, lines 1-3 of Kawada). Therefore, it would have been obvious to combine Kawada with Campbell to obtain the invention as specified in claims 8, 15, 24, 33, 40 and 49.

Regarding claims 9, 16, 25, 34, 41 and 50: Campbell does not disclose expressly that said motion detector generates said motion metric value in accordance with $\Delta = \max(\Delta_c, \min(\Delta_n, \Delta_s))$, where Δ is said motion metric value.

Kawada discloses using median filtering to determine the motion vector to use for the center pixel, thus eliminating large motion vectors which are the result of noise (column 3, lines 44-50 of Kawada). For the case of using the three motion vectors $(\Delta_c, \Delta_n, \Delta_s)$, as discussed in the arguments regarding claims 8, 15, 24, 33, 40 and 49, said median filtering is expressible in the form $\Delta = \max(\Delta_c, \min(\Delta_n, \Delta_s))$.

Campbell and Kawada are combinable because they are from the same field of endeavor, namely filtering, interpolating and processing video image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply median filtering, as taught by Kawada, to determine the motion vector of the pixel to be interpolated. The motivation for doing so would have been to reduce the effects of noise (column 3, lines 48-50 of Kawada). Therefore, it would have been obvious to combine Kawada with Campbell to obtain the invention as specified in claims 9, 16, 25, 34, 41 and 50.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is 571-272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

James A. Thompson
Examiner
Technology Division 2625

26 July 2006

David Moore

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